paper is converted into a to-and-fro motion of a lever to which the point is attached, and which is made to actuate a bell, or "sounder," and give rise to audible signals in the usual way. It is necessary to moisten the paper with a solution of certain chemicals. Potash was at first used, but a solution of sulphate of soda or of common salt and pyrogallic acid is found to be best.[1]

"The advantage of this instrument, which Mr. Edison calls an *electro-motograph*, is said to be its extreme sensitiveness, it having been worked over a circuit of two hundred miles with only two cells, so that with weak currents, unable to affect ordinary instruments, the electro-motograph can receive messages. More than this, the speed of its working is greater than with the ordinary instruments. Using it as a relay, that is, an instrument for translating weak currents into strong ones, no less than 1,200 words per minute have been transmitted by its means, or five times as fast as it is possible for any person to read the message which comes through the instrument. So prompt and delicate is the motion of this machine that Edison has applied it to the purposes of the receiving instrument for the Reiss telephone, a musical telephone that was made many years ago. The slipping of the paper causes a slight sound. If, then, we sing a certain note into the Reiss transmitting instrument, which vibrates in unison with that note, we obtain the same number of electric currents produced per second as we had of sonorous vibrations in the moving diaphragm. Thus, if we sounded the middle C we should get 264 vibrations, and there would be 264 electric currents, and 264 slips of the paper, thus producing a note of the same pitch in a distant room. The cause of the curious slipping has not been fully ascertained. It may possibly be due to that peculiar repulsive effect to which Mr. Crookes has lately drawn attention, and which produces the dark region around the negative electrode during the continuance of an electric discharge in a vacuum tube, or it may simply be due to electrolytic action."

It is, then, this principle which Edison has made use of in his new receiver, which is of the simplest construction. A diaphragm, preferably of mica, some four inches in diameter, held in a suitable framework, has attached to its centre a spring, or "pawl," the free end of which rests on a little cylinder of chalk, capable of rotation by the hand or other means. The chalk cylinder replaces the paper in the electro-motograph, and is necessarily impregnated with sulphate of soda, or other suitable solution. As the cylinder is rotated, the friction of the spring on the chalk causes the diaphragm to be pulled in or pushed outwards, according to the direction of the rotation. So far the operation is purely mechanical; as soon, however, as the current passes, either owing to electrolytic action or the friction, it is lessened, and the diaphragm tends to spring back to its normal position; on the cessation of the current the friction is restored, to be lessened on the recurrence of another electric wave. Thus, a series of tremors are given to the diaphragm corresponding to the swiftly changing character of the electric waves, and these again faithfully express the motion of the diaphragm at the transmitting end. It will thus be evident that the incoming current has simply to do the work of liberating the already strained diaphragm. As everyone knows, in Bell's telephone the voice has to do the work of creating the current at the transmitting end, and the feeble magneto-electric currents thus generated throw into motion the diaphragm at the receiving end. In Edison's telephone this is not so. The voice at the transmitting end has simply to vary the *electric* resistance in the path of a current generated by an ordinary voltaic battery; stronger currents can thus be sent along the line, and these arriving at the receiving end, have merely to vary a *mechanical* resistance, and not to do the work of overcoming the inertia of the diaphragm. It is probable the rotating chalk cylinder acts on the diaphragm with its attached spring like a resined bow on a violin string; vibrations are set up, the extent, rate, and manner of which are modified by the varying friction due to the telephonic currents. Whether these new receivers will retain their present efficacy when in constant use remains to be seen. We should be inclined to think the soft surface of the chalk will eventually wear with the friction, and that a more permanent arrangement will have to be devised. No invention, however, reaches perfection at once, and the present receivers, excellent as is their performance, were, we understand, hastily made in a few days, in compliance with the urgent request of Mr. Edison's courteous representative in London, Col. Gouraud.

The instrument has the appearance of a small box attached to the wall, and from which there projects a single funnel. Sounds of singing, speaking, whistling, sent from the other end, quite a mile off, were heard in every part of a moderately sized room. Telephonic connections, now so common in America, have been established by Col. Gouraud between various business houses in the city; and we believe that shortly this method of communication must become quite common.

NOTES

DR. MICLUCHO MACLAY, the eminent Russian Naturalist and New Guinea explorer, has been trying to rouse the Linnean Society of New South Wales and the scientific public of Sydney to the necessity of founding a zoological station, similar to that at Naples. He tells of the great inconvenience he himself has suffered during his residence at Sydney from the want of such a station, even though the Hon. Mr. Macleay placed his museum at his disposal. But Dr. Maclay's scheme embraces much more than a station at Sydney. He has written to the German Eastern Asiatic Society at Japan and to Mr. August Godeffroy at Samoa, urging that similar stations be founded at these places, and he has reason to believe that his proposals will not be without result at both places. Thus should zoological stations be instituted at Sydney, in New Zealand (as Dr. Maclay also proposes), in Japan, and at Samoa, we might hope in a very few years to have a fairly complete knowledge of the fauna of the Pacific. Dr. Maclay's proposal deserves the heartiest encouragement, and we trust that ere long it will be fully carried out. We hope the people of Sydney, at any rate, will take Dr. Maclay's appeal to heart; he tells them, moreover, that he will judge of the intensity of the scientific life of Australia by the interval which elapses between the reading of his paper on the subject and the actual foundation of the station. He shows what valuable results have followed the foundation of the Naples station, and gives a few hints as to how such a station at Sydney should be organised. We shall be curious to see what will be the result of Dr. Maclay's fervent appeal.

WE are requested to state that on and after April 1 any person may obtain by telegraph from the Meteorological Office the latest information as to the weather in any district of the United Kingdom by payment of a fee of 1*s*. in addition to 2*s*. the cost of the message to the Meteorological Office and the reply. The telegram containing the inquiry must not exceed twenty words in length, and must be addressed, "Meteorological Office, London." The Meteorological Office does not undertake to give any information which is not substantially included in the latest notice posted at its own doors, nor does it give forecasts of the weather on the Atlantic coasts of the British Isles; although it is ready to furnish any information it possesses as to the actual state of the weather on those coasts. The Meteorological Office is open for such inquiries between the hours of

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[1] Practical difficulties have, we believe, been found in the working of the motograph, so that it has not come into telegraphic use.

11 A.M. and 8 P.M. on week days, and between 6 P.M. and 8 P.M. on Sundays.

THE Emperor of Germany has confirmed the election of Sir G. B. Airy as a foreign member of the Berlin Academy.

RUSSIAN astronomers seem determined to outstrip their *confrères* in other countries in the matter of telescopes; we are informed that funds have been subscribed for the construction, for Pulkowa Observatory, of a refractor of thirty-two inches aperture.

WE have received a circular from the Research Committee of the Institution of Mechanical Engineers, drawing attention to three subjects which they have selected for first investigation, and asking for any information, bearing on all or any of them, which any one interested may be willing to communicate: *e.g.*, records of unpublished experiments, references to authorities on the question, copies of books or papers in which it is treated, &c. The Committee would be glad to receive such information in full detail, and at the earliest convenient date; and it will be suitably acknowledged in their report. The subjects are:—Subject A. The hardening, tempering, and annealing of steel. Subject B. The best form of riveted joints to resist strain, in iron or steel, or in combination. Subject C. Friction at high velocities, specially with reference to friction of bearings and pivots, frictions of brakes, &c. The address of the Institution is 10, Victoria Chambers, Victoria Street, Westminster.

IN the Monthly Weather Report of the U.S. Signal Service for January, 1879, are many points of great interest to meteorologists. The particular report before us belongs to the division of "Telegrams and Reports for the Benefit of Commerce and Agriculture," and contains a multitude of well-arranged data received up to February 14. The charts accompanying the Report are of special interest. One of them shows the tracks of ocean-storms from November 23, 1878, to January 16, 1879, and exhibits the paths of seven storms. No. 6 of these is shown to have commenced in California on January 6, to have come down to the Gulf of Mexico by the 8th, to have gone north-east through the United States to Newfoundland, between the 8th and 11th, across the Atlantic between Scotland and Iceland, the storm expending itself off the coast of Norway on the 15th, one week after starting from California.

EXPERIMENTS in electric signalling and reconnoitring have been made at Mont Valérien on a large scale. Details are wanting, as the French Government think it prudent to keep secret almost all experiments relating to military matters.

WE have received an interesting sketch, with portrait, by Prof. Ehlers, of Göttingen, of the late Wilhelm Engelmann, so long the head of the well-known Leipzig scientific publishing house, and who did so much for the advancement of scientific knowledge in Germany.

The Science Index is the title of "A Monthly Guide to the Contents of the Scientific Periodicals," the first number of which we have just received, though dated January. This delay is apologised for, on account of the difficulty of getting together a first number. The aim of the journal is highly to be commended, and if carried out on a thoroughly well-considered plan, ought to prove of great service. We are not disposed to criticise this first number too severely, though we think there is considerable room for improvement. It is by no means exclusively devoted to science, including as it does Art, Architecture, Strikes, Baking and Confectionery, Bells, Commerce, and other miscellaneous topics. Indeed, on the principle which has been partially followed, we do not see where the line is to be drawn short of an index to everything. We hardly think the plan has been well considered, and we think that many of the subjects indexed might be omitted with advantage if it is meant to be really a Science Index. Judging from the number of misprints, this number seems to have been hastily got out. In geography alone we meet with such horrors as "Afkanistan," "Leybian Desert," "Oxies" for Oxus, &c. References to the Swedish Arctic Expedition occur under different headings, as if the compiler did not know that the items referred to the same thing. Still, the index is a step in the right direction, and we hope the editor will take competent council, and introduce such improvements as will make his *Science Index* what it might and ought to be.

MAJOR MAJENDIE, as the result of a series of experiments with dynamite, has come to the conclusions that frozen dynamite is considerably less sensitive to explosion by a blow than unfrozen dynamite; that cartridges of dynamite having small quantities of exuded nitro-glycerine within them are decidedly more sensitive to explosion by a blow than cartridges in which there is no such exudation; that frozen dynamite is much more susceptible to explosion by simple ignition than unfrozen dynamite; that frozen dynamite is much less sensitive to explosion by the impact of a bullet than unfrozen dynamite; that the danger attending the mere breaking in two of a frozen dynamite cartridge does not seem to be of the formidable character indicated by the Austrian regulations; and that frozen nitro-glycerine is not susceptible of detonation by detonators of the same strength as those with which the detonation of unfrozen nitro-glycerine may be readily and certainly effected.

THE *Bradfordian* is the title of a magazine "written and supported by the two Grammar Schools" of Bradford. It has a varied programme, in which, we are pleased to see, science finds a place.

THE *Times* Geneva correspondent writes that M. A. Borel, of Chaux-de-Fonds, has just had the good fortune to find in the Lake of Neuchatel, between Bazuge and Chatelard, a prehistoric canoe, probably the finest specimen of the sort that has yet come to light in Switzerland. Hollowed out of a single piece of oak, the vessel is 8 metres long, 90 centimetres wide, and 65 centimetres high. It is well finished, and in a perfect state of preservation. The stern carries a spur, and the prow is curved in the form of a hook, probably for the purpose of attaching it by a rope to a landing-place. The canoe is sufficiently large to carry twelve persons. There is no appearance of rowlocks, but the supports on which the thwarts formerly rested are still plainly to be seen. M. Borel proposes to present this interesting "find" to the Museum of Chaux-de-Fonds.

A PETROLEUM spring, one boring of which has yielded 2,000 kilos in twenty-four hours, has been discovered at Pohar, in Austrian Poland.

ACCORDING to the report of H.M.'s Consul for Hiogo and Osaka, the Japanese claim that petroleum has been known in Japan for over 1,200 years, and it would certainly be curious if the numerous springs which exist in certain localities should have escaped notice in their immediate neighbourhood. It is doubtful, however, whether it was ever utilised, and certainly no attempt was made to refine it before the arrival of foreigners. The first efforts in that direction were made near Niigata in 1875, but the petroleum then refined failed to stand a higher test than 75° F. Accordingly Prof. Lyman, who had previously performed a similar service for India, was sent for from America to conduct a professional survey of the region. His report, however, was unfavourable, chiefly on the ground of an insufficient supply. This opinion the Japanese are now about to test, for which purpose they have established a refinery near Hiogo. Its supplies of crude oil are to be drawn from the province of Potomi, distant about 100 miles to the north, the transport being conducted by sea.

At the evening meeting on Monday, the 31st inst., at 8.30, at the Royal United Service Institution, D'Arlincourt's telegraph will be exhibited and worked, illustrative of a means of communicating orders in the field. The paper of the evening is on "Orders in the Field and the Means of Communicating them," and will be read by Major Webber, R.E.

A pamphlet has just been issued at Quebec, compiled under the auspices of the Boards of Trade of that town and Montreal, dealing with the subject of telegraphy with the coasts and islands of the Gulf and Lower River St. Lawrence, and the coasts of the maritime provinces, considered from the point of view of its relation to the shipping, to the fisheries, and to the signal service. The *brochure* is accompanied by a large-scale coast telegraph chart of the region named, delineated under the direction of the Hon. P. Fortin, on which are shown existing and projected telegraph lines and the ordinary tracks of vessels.

At the last meeting of the Eastbourne Natural History Society an interesting paper was read by Dr. Murdie on sea-water, its adaptations to various purposes, and its management in reference to marine zoology.

Mr. Tegetmeier has published a facsimile reprint of Moore's "Columbarium" from the original edition of 1735. The work, the source from which all subsequent works have taken their rise, ought to interest both fanciers and naturalists; by its aid, as Mr. Tegetmeier says, the latter may trace the alterations produced in varieties of the same species, continued for 150 generations. Moore was a well-known doctor of the City of London, and was so eminent in his way as to merit a bantering satire from Pope.

Prof. Edward Morse, of Tokio, announces that he has discovered undoubted evidences of the practice of cannibalism among the early inhabitants of Japan. These evidences he describes in a paper read at the Biological Society of the Tokio Dai Gaku.

The *Colonies and India* has an interesting note on the subject of Vanilla, which appears to be mainly supplied by Mauritius, Brazil, and Mexico, but could probably be grown in many of our colonies. The parasitical plant which yields this aromatic bean will climb up any tree that gives sufficient shade; it attains a height of about a foot, and thrives for thirty or forty years, producing some fifty pods each year after the second. The beans take eight or nine months to mature, and are gathered between October and December; they are oiled occasionally to prevent excessive shrinking, and dried in the sun; when warm they are wrapped in woollen cloths to absorb the evaporation, and during the process attain their black silvery hue. Vanilla is the most costly, in proportion to weight, of all vegetable productions, and only a few hundredweights reach England annually.

Masson, of Paris, has published in a collective form, under the title of "Revues scientifiques publiées par le journal *La République Française*," a large number of papers on subjects of scientific interest published at intervals in that paper, under the direction of Prof. Paul Bert.

The comparative effects of pressure and hammering in changing the volume of soft masses, has been investigated by Herr Kick (*Ding. Pol. Jo.*). A carefully cast lead cylinder 100·3 mm. high, 70·2 mm. diameter, and 387·85 ccm. at 15°, was compressed in a Gollner's machine to 69 mm. and 50 mm. height respectively. The volume was found to be hardly altered at all (it became 387·814 ccm. in the second case). A lead cylinder 59·7 mm. high and 50 mm. diameter was now beat down by means of a steam hammer to 16·7 mm. height. The volume was reduced from 117·56 to 117·33 ccm. Thus, to condense metals, it is necessary to resort to beating, or to use extraordinary pressure on inclosed material.

Some interesting experiments with regard to tension of carbonic acid in blood have recently been made by Herr Gaule in the physiological laboratory of Prof. Ludwig (Du Bois Reymond's *Archiv*). He notes the following differences between blood and serum in this connection:—1. The proportion of carbonic acid in serum is higher than that in blood. 2. The tension of carbonic acid in serum is less than that in blood. 3. If in serum the quantity of free carbonic acid diminish, there is decomposed only the quantity of bicarbonate of soda which corresponds to this diminution, but in blood more. 4. On addition of simple carbonate of soda, the tension of free carbonic acid diminishes in the serum, but in blood it does not. 5. In blood there exists a substance which is capable of dissolving the entire combination between carbonic acid and soda, but in serum not. This substance, which attracts the carbonate of soda, is very probably hæmoglobin, which then further decomposes the combined salt into soda and carbonic acid, and thus maintains with the bicarbonate salt and the free carbonic acid a series of complicated exchanges, which probably render possible and promote the giving out of carbonic acid and the removal of it from the tissues and the lymph.

Carl's *Repertorium für Experimental Physik* (xv. Band, 2 Heft) contains an illustrated account of the new meteorological magnetic observatory for St. Petersburg at Pawlowsk. In the same number we note a useful simplification of the spectroscope, by Herr Hüfner.

The measuring of sea-depths with the lead leaves much to be desired in point of accuracy. Dr. Rühlmann is of opinion (*Annalen der Physik*) that reliable results will be had, only when it is practicable to measure the weight of the water column. This weight, and therewith the height of the column, might be easily ascertained from pressure on a manometer. And the point is, to combine with the pressure-measuring instrument an arrangement whereby one may read off what the apparatus indicates at that point, the depth of which below the surface is to be determined. To construct such a manometer need not, he thinks, greatly puzzle the mechanician. The various forms of aneroid barometer are a good direction. Suppose, *e.g.*, a manometer made after this fashion, and available for very high pressure, and let there be adapted to it an electro-magnetic arrangement, wherewith, when a current is sent through it from the ship, the index is pressed so forcibly against the scale, that a mark is produced on this. In this way, closing the circuit at different times, it would be possible to determine the pressure in different parts of the sea. If, at the same time, there were sunk a junction of a thermo-element, the other junction of which was kept at constant temperature, and if the current of this thermo-element were conducted through a sensitive marine galvanometer on the ship, one could ascertain the temperature of the water at the points for which measurements of pressure were obtained. Very accurate results could only be expected, when not only the pressure at the sea-bottom, but also the temperature of the water at as many points of less depth as possible, were known. Dr. Rühlmann is not aware if such a method has been put into practice, but he gives an exposition of the theory of it.

The additions to the Zoological Society's Gardens during the past week include an Indian Fruit Bat (*Pteropus medius*) from India, presented by Capt. F. P. Millett; a Mule Deer (*Cervus macrotis*) from Ottawa, Illinois, U.S.A., presented by Judge Caton; two Gaimard's Rat Kangaroos (*Hypsiprymnus gaimardi*), from Australia, presented by Mr. Ernest E. Harrold; a Spotted Ichneumon (*Herpestes auropunctatus*) from India, presented by Miss H. Boteler; a Brent Goose (*Bernicla brenta*), European, presented by Mr. H. A. Dombrain; a Black-faced Spider Monkey (*Ateles ater*), a Black-handed Spider Monkey (*Ateles melanochir*) from South America, received in exchange; a Black necked Stilt Plover (*Himantopus nigricollis*) from South America, purchased; three Common Badgers (*Meles taxus*) born in the Gardens.

THE PARIS ACADEMY PRIZES

LAST week the Paris Academy held its annual public meeting, when the prizes for 1878 were awarded. According to old custom, M. Fizeau, the president of last year, was in the chair. He remarked on the unprecedentedly large number of prizes that were not awarded, either because there was no competition or because there were no competitors of sufficient merit. On this account several of the most important prizes have not been awarded this year, and it seems to be the common opinion that some of the problems proposed are much too difficult. M. Dumas read an *éloge* on M. Balard, the discoverer of bromine, and M. Bertrand did the same for Leverrier. M. Bertrand made no allusion to the part taken by Leverrier in the public affairs of his time, and made but slight allusion to his organisation of the Meteorological Service, and that almost as if it were not a thing quite worthy of encomium. M. Bertrand's address does not seem to have given universal satisfaction, and several of the audience on leaving the hall were heard to say: "Quant à l'éloge de Leverrier il est encore à faire." The following are the principal prizes awarded at the meeting:—The Extraordinary Prize of 6,000 francs for the greatest prgress in naval construction, to M. Perroy and Lieut. Baills; the Poncelet Prize in Mechanics to M. Maurice Lévy; the Montyon Prize of 1,000 francs, in Mechanics, to Mr. George H. Corliss, for his well-known engines; the Plumey Prize to Capt. Vallessie, for his differential counter to regulate the progress of steamships. In Astronomy the Lalande Prize was awarded to M. Stanislas Meunier, for his researches on meteorites; the Valz Prize to Dr. Julius Schmidt, for his lunar charts. In Physics the Bordin Prize was awarded to M. Reynard for his researches in connection with Ampère's law. In Chemistry the Jecker Prize was awarded to M. Reboul, specially for his memoir on the isomers in the propylene series. In Botany the Barbier Prize was given to M. Ch. Tauret, and encouragements of 500 francs each to M. Cauvet and M. E. Heckel; the Desmazières Prize to Dr. Bornet; the Shore Prize to Prof. Ardissone for his "Floridee Italiche;" in Anatomy and Zoology the Serres Prize was awarded to Prof. Alexander Agassiz, for his various embryological and other investigations; and the Montyon Prize in Physiology to M. Charles Rechet, for his researches on gastric juice. The Tremont Prize was given to M. Marcel Deprez for his application of electricity to the solution of various problems in mechanics; the Gegner Prize to M. Gaugain; the Delalande Guérineau Prize to M. Savorgnan de Brazza, for his exploration of the Ogové River; and the Prize founded by Mdme. de Laplace to be awarded to the pupil who leaves the Polytechnic School with the highest honours, to M. de Béchevel.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

M. FERRY, the French Minister of Public Instruction, has presented a project for the reorganisation of the Superior Council of Universities. According to the proposals of the minister, which are sure to be adopted by the Assembly, the bishops and other religious members are to be excluded, and the Council exclusively composed of persons belonging to the teaching profession. Moreover, it is proposed that all degrees be henceforth granted by the State, and only to those who have taken the curriculum of a recognised university.

THE examiners for the Burdett-Coutts' Scholarship (Oxford) have awarded it to Mr. Algernon Philips Thomas, B.A., Scholar of Balliol College; and they consider Mr. Henry Nicholas Bidley, B.A., of Exeter College, worthy of honourable mention.

SCIENTIFIC SERIALS

Bulletin de l'Académie Royale de Belgique, No. 12, 1878.—In this number is a paper by M. van Beneden, giving a historical sketch of whale-fishing and of the first Arctic expeditions.—A lecture by M. Houzeau, the president, has for its subject certain enigmatical phenomena of astronomy.—M. van Rysselberghe describes a parabolic regulator, rigorously isochronous, and the velocity of which can be varied at will. Regarding it, M. Folie reports that it has too many articulations and movable rings for common use, and it hardly realises ideal perfection for physical and astronomical apparatus.—M. Malaise announces the discovery of a mineral species new for Belgium, viz., arsenopyrite or mispickel, and M. Monier describes a hydrophane opal and hydrated transparent silica, obtained by action of oxalic acid on alkaline silicates.—There are also several mathematical papers and reports on prize competitions (subjects chiefly botanical).

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti. Vol. xii. fasc. ii.—We note the following papers in this number:—Considerations on a letter of Tyndall's regarding heterogeny, by Prof. Giovanni.—On the causes of asphyxia and the agglutination of the blood corpuscles in diphtheria, by S. Trevison.—The Sanitary Office of the German Empire, by Dr. Zucchi.—Studies on milk (continued), by Drs. Pirotta and Riboni.—On cortical psycho-sensory centres, by Professors Luciani and Tamburini.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, March 13.—C. W. Merrifield, F.R.S., president, in the chair.—Mr. J. D. H. Dickson was admitted, Mr. R. Hargreaves and Prof. W. E. Story were elected, and Mr. Donald McAlister was proposed for election into the Society.—Prof. Cayley, F.R.S., spoke briefly but in high praise of the late Prof. Clifford's work as a mathematician, instancing more particularly his papers "On the Canonical Form and Dissection of a Riemann's Surface," "On Mr. Spottiswoode's Contact-Problems," and "The Classification of Loci."—The chairman, the Rev. A. Freeman, and Dr. Hirst, F.R.S., added a few remarks on the loss the Society and the mathematical world generally had sustained, and expressed the hope that steps would be taken to secure the publication, if desirable, of any mathematical papers Prof. Clifford might have left.—Dr. Hirst made a statement respecting the "De Morgan Memorial" Medal to be presented to the Society to be awarded in such manner as the council shall hereafter determine; it appeared that the bust and die for the medal had been executed by Mr. Woolner, and that after all claims had been met there would still be a small sum required to make up the requisite total for the purpose contemplated. The late Prof. De Morgan was the first president of the Society and always took a warm interest in its advancement. It was resolved that a subscription list should be opened in order that old pupils and members of the Society might have an opportunity of aiding in the above design. Subscriptions for this special purpose may be sent to Mr. Tucker (Hon. Sec., University College School, W.C.), or to Mr. Alfred Wills, Q.C., 12, King's Bench Walk, E.C., the Hon. Sec. to the general fund. Copies of the medal were exhibited (Profile with dates of birth and death, on the reverse, Pascal's hexagram, surrounded by the "Zodiac of Syllogisms," and the title President of the London Mathematical Society).—The following communications were made:—On differential equations, total and partial, and on a new soluble class of the first and an exceptional case of the second, by Sir J. Cockle, F.R.S.—Discussion of two double series arising from the number of terms in determinants of certain forms, by Mr. J. D. H. Dickson.—Two geometrical notes relating to surfaces of the second order, by Prof. H. J. S. Smith, F.R.S.

Physical Society, March 8.—Prof. W. G. Adams in the chair.—Dr. Hurst and Mr. Jacob were elected Members.—Prof. Ayrton brought forward a new theory of terrestrial magnetism originated by himself and Prof. Perry of the Imperial Engineering College, Japan. It is well known that metal cages act as screens against induction in the case of static electricity or electricity at rest, and hence Clerk Maxwell, at the British Association meeting for 1876, suggested that no earth connection was necessary for lightning conductors, since a cage would be sufficient. But dynamic electricity is different from static in this respect, and Professors Ayrton and Perry found that even a thick block of copper will not screen a coil of wire from the induction of a *current* flowing in a neighbouring one. Some experiments of Dr. Muirhead, not yet published, would seem to favour the view that a current is a series of intermittent changes of potential, and that the inductive effect was due to a difference in the epochs of the currents in the two coils. It was found by Helmholtz that a quantity of static electricity in mechanical